Model Building Process
Adding a Shaft

➢ Right Click on ‘New Design’ and select ‘Shaft’ in Add the dropdown list.

➢ The ‘Enter Shaft Properties’ window will appear where you can set the shafts length, outer diameter and bore as well as its name.

➢ This sets the basic shaft size. Detailed shaft profiles can be added or edited later.
In the same way as adding the shaft, bearings can be added by right clicking on ‘New Design’ and selecting bearing from the ‘Add’ drop down list.

Multiple bearings can be added at the same time by changing the ‘Number to add’ option.

Add 2 bearings to the model.
By selecting the ‘Connect component’ tool in the top right corner of the MASTA window (2 chain links), the bearings can be connected to the shaft.

There are two methods to connect the components. Either select the bearing in the window and drag it onto the shaft or select the bearing in the assembly tree and drag it onto the shaft in the assembly tree.

The following window appears to confirm that you wish to connect the two components.

Connect a bearing at both ends of the shaft
Once the bearings are connected to the shaft, their axial position can be set.

By selecting the bearing, the axial offset can be changed to ensure the component is positioned in the correct location.

The reference point for the measurements can also be changed (i.e. the distance can be measured from the right hand side of the shaft).
Position the bearings at offsets of 10mm and 140mm from the left edge of the shaft

Remember to save your model regularly
Selecting a Bearing Type

➢ By default, the bearing added will be a concept bearing with default stiffness values.

➢ In the properties window, select the ‘Rolling Bearing’ option from the drop down list.
Choosing a Bearing Designation

1. Choose bearing size parameters.
2. Select Radial Ball Bearing
3. Select SKF 6207 Radial Ball Bearing

Further refinement options if required

After selecting the type of bearing, the designation of the bearing can be chosen.

Based on the shaft the bearing is connected to, MASTA will enter values for the bore and the outer diameter of the bearing. These can be edited if necessary.

From the ‘Type’ drop down list. Select ‘Radial Ball Bearing’.

Select the SKF 6207 Radial ball bearing.

Further refinement can be achieved if a designation is known or if you have a preferred bearing supplier.

Repeat for the second bearing.
Creating a Sub-Assembly

➢ Right Click on ‘New Design’ to add a sub assembly to the assembly tree.
➢ Sub-assemblies can be used to organise the model. Once an analysis has been run, sub-assemblies can be selected to display results for only the components within the sub-assembly.
➢ To move the components, in the assembly tree, drag the shaft and bearings into the sub-assembly.
To duplicate an assembly, right click on the assembly in the tree and select the ‘Duplicate’ option in the drop down list.

This will duplicate all components within the assembly as well as the connections between the components.
➢ Duplicate the assembly twice to create three shafts with bearings
➢ Rename the assemblies to the names shown above (this will help with later analysis)
Adding a gear pair

➢ Add a cylindrical gear pair by right clicking on the root assembly

➢ Gear geometry details are shown on the following slides
Gear Set 1 Geometry

Create Cylindrical Gear Pair

- **Name**: Design
- **Teeth**
  - Pinion Number of Teeth: 28
  - Wheel Number of Teeth: 59
- **Ratio**: 2.289231

**Detail**

- **Centre Distance (mm)**: 95.4
- **Normal Module (mm)**: 2
- **Helix Angle (°)**: 28.5
- **Normal Pressure Angle (°)**: 17
- **Pinion Face Width (mm)**: 30
- **Wheel Face Width (mm)**: 30

Ready to create gear set 'Design'
➢ Add a second gear pair using the details shown here.
Connect and position gears

➢ Connect the gears to the shafts in the same way as the bearings (slide 4) and position them to create the model shown above
Position shafts in X-Y

➢ By default, the three shafts will all be in line when viewed in the X-Y plane

➢ Choose the X-Y view to view shaft positions
Position shafts in X-Y

➢ Reposition the intermediate shaft as shown above
  ▪ Distance = 95.4mm
  ▪ Theta = 20°

 Ensure that the input shaft is the origin

Origin shown by crosshairs

Select the intermediate shaft to reposition
Position shafts in X-Y

➢ Reposition the output shaft at a distance of 210mm from the input
Choose the 3D View tab to view the model in 3D.
➢ Use the Edit Shaft Profile tool to change the profile of the input shaft
➢ Update both the inner and outer profile to the shape shown above
➢ Points and lines can be dragged on screen or values can be entered below
➢ Update the output shaft profile
Adding power loads

- A power load is a point where torque enters or exits the system
- Add a power load to the root assembly and duplicate it to create two
- Rename the power loads as input and output
➢ Connect the power loads as in the image above
➢ Rename all components, this will help with identifying them for further analysis
Use the Load Case mode to add a Design State and 3 subsequent load cases, rename these to match the image above.
Select the design state editor and input the load case data as per the image above.
Next task...

➢ Please now work through the document:

4. Power Flow and System Deflection Analysis